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Connected to it is a small pipe which supplies a current of water that bathes the collodion filament, and sets it so that it can be secured by pincers and drawn out without breaking. It is afterwards led to a spool, on which it is wound.

The second apparatus, which is more complete, contains a number of such glass tubes, and illustrates the method by which two or more filaments can be drawn out and twisted so as to form one thread. The third machine is arranged for practical work. The dissolved collodion is contained in a copper receiver having a capacity of about 15 litres. In this receiver it is subjected to a pressure of from 8 to 10 atmospheres that forces the liquid through a horizontal tube, to which are connected 72 capillary tubes, each with their surrounding water-casings. In this manner 72 filaments of artificial silk are produced simultaneously, and these can be spun into threads of various thickness; three such filaments being twisted as a minimum, and ten as a maximum. To effect this, there is placed parallel to the horizontal tube a rack carrying a series of bronze blades that serve to guide the filaments. The twisted threads are wound upon bobbins running on spindles mounted parallel to the horizontal tube. A frame carrying as many pincers as there are capillary tubes can be put in movement by means of a cord, and, if any of the threads are broken, these pincers take hold of the filament and join up the broken parts. This apparatus is enclosed in an hermetically sealed glass case, through which a current of air is continually forced by means of a fan. This air is warmed to assist in drying the filaments; but it becomes cool at the exit, and deposits the vapors of ether and alcohol. The circulating water, which is employed to harden the filaments, is discharged into a receiver. It contains a large percentage of the volatile products, which can be recovered by distillation, and in this way only about 20 per cent of the ether and 10 per cent of the alcohol are lost. One tube can produce from 3 to 5 pennyweight of filaments per hour, or a length of nearly 14 miles. The apparatus works continuously, and with but little attention; and, if by any chance one of the capillary openings becomes sealed, it can be cleared by applying heat.

Under the conditions in which the machine is exhibited at work, the artificial silk can be sold at from 15 francs to 20 francs the kilogram, while real silk costs from 45 francs to 120 francs the kilogram. The manufactured product resembles very closely the natural one. It is smooth and brilliant, and the filament has a strength about two-thirds that of silk. Woven into a tissue, it appears stronger and less liable to cut, this property being due to the fact that it is not charged with destructive materials, which appear to be always used in dying silk, such as zinc or lead. These foreign matters are probably introduced solely for the purpose of weighting the silk; but there is no object for similar adulteration of the artificial product, because the metallic preparations employed cost as much as the collodion thread. According to M. de Chardonnet, the density of his product lies between that of raw and finished silk. Its resistance to a tensile strain varies from 15 tons to 22 tons per square inch (copper breaks under a load of about 18 tons, and iron under 23 tons). The elasticity is about the same as that of natural silk, and the inventor claims that it has a superior brilliancy. M. de Chardonnet exhibits a number of stuffs woven wholly with the artificial silk, as well as others mixed with natural silk and other textile materials. The results are really very remarkable. Among other objects, he shows a chasuble of artificial silk which will bear very close examination.

Artificial silk is not yet manufactured on an industrial scale, but it appears that this will very shortly be done; and, while it is impossible to foretell with certainty what will be the commercial results of this curious invention, it is impossible to resist the conclusion that it is highly practicable, and that it even contains the elements of great future success.

TENTH CONVENTION OF THE NATIONAL ELECTRIC-LIGHT ASSOCIATION.

THE tenth convention of the National Electric-Light Association was held at Niagara Falls, N.Y., on Tuesday, Wednesday, and Thursday, Aug. 6, 7, and 8, the sessions being held in the Casino. The convention was called to order on Tuesday morning by Mr.

E. R. Weeks of Kansas City, president of the association, who, in his opening address, briefly outlined the objects of the meeting, and gave a synopsis of the progress made in the electric-light industry since the preceding convention. The address concluded with the statement that statistics of the association show that the number of arc lamps in service in the United States alone during the last six months has increased from 219,924 to 237,017; that of incandescent lamps, from 2,504,490 to 2,704,768; and that the number of street-railroads operated by electricity is now 109, comprising 575 miles of track and 936 motor-cars. The capital invested in these industries at present amounts to \$275,000,000.

At the conclusion of his address the president introduced the Hon. W. C. Ely of Niagara Falls, who delivered the address of welcome. In his address Mr. Ely touched upon the much-talked-of project of utilizing Niagara Falls as a motive power for the generation of electricity on a grand scale, quoting Sir William Thomson's statement that Niagara Falls possesses more power than all the coal-mines in the world, and Edison's remark that Niagara is the greatest storage-battery in the world. "This latter," Mr. Ely added, "is absolutely truthful, and, with the power of the waterfall developed by means of an hydraulic tunnel, a system of powerful dynamos to transform the water-power into electricity, and this transmitted to Buffalo, that city might be supplied with light and power far more cheaply than at present, and a demonstration of the capabilities of electrical power and transmission afforded that would give us something more sure than the world has as yet had."

After Mr. Ely's address, the secretary read a letter from the mayor of this city to the president of the association, Mr. Weeks, requesting his presence at a "conference of representative citizens to consider the advisability of holding an international exposition at New York in 1892, and to arrange for the preliminary work if it is deemed advisable." This letter was responded to by the appointment of a committee of five, whose chairman is to represent the association in any manner desired by the mayor. The members of the committee are, Dr. Otto A. Moses of New York, chairman; E. T. Lynch, jun., of New York; C. J. Field of Brooklyn; Fred A. Gilbert of Boston; and J. P. Morrison of Baltimore.

The report of the committee on the revision of the constitution and by-laws was then received, printed copies of the proposed constitution ordered distributed among the members, and its discussion made a special business for the Thursday morning session. The committee on underground conduits and conductors, being called upon for its report, asked for an extension of time until the next annual convention, which was granted. Mr. E. A. Foote then read a paper on "The Value of Economic Data to the Electric Industry," which was discussed by Messrs. Morrison, Morris, De Camp, Coggeshall, and Whipple; and a resolution based upon the paper was adopted, to the effect that a committee of five be appointed by the president to report at the next convention of the association forms and a system of records and accounts to be kept by central station companies, a system for reporting the same to the association, and for comparing and publishing the data so secured, for the use and benefit of the members of the association.

Mr. M. D. Law then read a paper entitled "The Perfect Arc Central Station," treating of boiler-rooms and boilers, engines, shafting, dynamos, switch-board, lines, store-room, and shop. This paper was discussed by Messrs. Morrison, Law, Smith, Leonard, and De Camp. At the close of the session the president announced the following committee on electrical statistics: A. R. Foote, chairman; A. J. De Camp, S. A. Duncan, E. F. Peck, and S. S. Leonard, assistants.

At the Wednesday forenoon session the secretary and treasurer presented their report, showing a present membership of 251, an increase of 55 per cent over last year. The annual income of the association is at present \$5,050, and the expenses for the past six months were \$2,241.80. The report of the committee on harmonizing electrical and insurance interests was then received and adopted, and the committee continued, with instructions to take under advisement the feasibility of establishing a mutual insurance company. A committee was also appointed to prepare a petition for the abolition of import duties on copper. At the afternoon session a paper was read by Mr. F. A. Wyman, on "The Constitu-

tionality of Execution by Electricity," and was discussed by several of the members, after which it was resolved that the association petition the General Assembly of the State of New York to repeal the electrical execution law at its next session. A paper by Mr. William Bracken, on "Electric Traction by Storage-Batteries," was then read by Mr. S. M. Young, after which J. F. Morrison, E. T. Lynch, jun., C. C. Martin, E. F. Peck, and A. J. De Camp were appointed a committee to nominate the executive committee, and to choose a place for the next convention.

At the Thursday morning session, after the report of the committee on legislation, Mr. C. C. Haskins read a paper on "Dynamo Room Accessories for Intensity, Potential, and Resistance Measurements." Dr. Moses then read the proposed new constitution, which was accepted, after which Mr. G. W. Mansfield read a paper on "Electric Railways," and Professor E. P. Roberts read one on "The Electrical Transmission of Power." The report of the committee on executive committee and place of next convention was then received and adopted, Kansas City being the place selected, and the executive committee being as follows: G. W. Hart, chairman; L. A. Beebe; J. A. Corby; B. E. Sunny; S. S. Leonard; C. R. Faben; P. H. Alexander; Frank Ridlon; and J. F. Morrison. The convention then adjourned.

HEALTH MATTERS.

Disinfection of Springs, and Number of Germs in Ground-Water.

DR. CARL FRANKEL, in the *Zeitschrift f. Hygiene*, reports a series of experiments made by him to determine some points of practical importance; namely, what are the relative values of tube-wells and pot-wells, and can they be disinfected by the measure usually recommended?

With regard to tube-wells, from their mode of construction they are not liable to contamination from surface impurities, as the pot-wells are, and it becomes of the greatest consequence to know whether they receive infective micro-organisms from more distant sources. The result of these experiments is, that as a rule the water entering tube-wells is absolutely free from micro-organisms. But it still appears that a growth of micro-organisms takes place in the tube-wells, and a consideration of all the circumstances points to the growth of a pellicle of micro-organisms clinging to the sides of the tube. Hence one way of disinfecting the tube-wells is to brush them clear, and then completely pump off the turbid liquid. In cases where this proceeding proves inadequate, a concentrated solution of carbolic acid and sulphuric acid dropped into the tube, and left for a day or two, will complete the disinfection. Disinfection of these wells by lime is quite unsuitable, as it forms a mortar, and seriously interferes with the entrance of water.

The ordinary pot-well, on the other hand, is incapable of disinfection, and Dr. Fränkel agrees with Plagge that it is a hygienic monstrosity. Considering how common pot-wells are in our country districts, these are results which require careful attention.

The tube-wells, which Dr. Fränkel found to furnish water freer from germs, were sunk in a part of Berlin which, at first sight, would seem to expose them to great risk of infection. In reality, however, after a time a thick pellicle forms in old soils, which effectually precludes the passage of germs beyond a certain depth. Two sources of error have here to be guarded against. In the first place, the pellicle or its equivalent, which prevents the passage of germs downward, may be broken through at some point, or the corresponding ground may be constituted in parts of pebbles or gravel, which allows of the transmission of micro-organisms; and, in the second place, the chemical constitution of the water passing away from these old soils will very likely be such as to lead to a free growth of micro-organisms, as was the case in these experiments. It is practically impossible to exclude all access of micro-organisms to the well.

The chief conclusions to be drawn from Dr. Fränkel's experiments are, that Abyssinian or tube-wells are infinitely preferable to the ordinary pot-well, and that a disinfection of the tube in the

manner indicated above is, as a rule, all that is necessary to make the water quite free from micro-organisms.

PHTHISIS IN ARMIES.—According to Dr. R. Schmidt of Munich, who has collected a mass of material connected with the statistics of phthisis, the number of soldiers who suffer from phthisis in the German army (excluding Saxony and Bavaria) is, says the London *Lancet*, 3 per 1,000; and the number of deaths from this cause, 0.9 per 1,000. In the Austrian army the numbers per 1,000 are 6.4 and 2.2 respectively; in the Italian army, 4.3 and 2.9. In the Russian and French armies, only the number of fatal cases is given, which is 12.5 per 1,000 in the former, and 2.2 per 1,000 in the latter case. In the English army, which on account of long service and foreign service is not to be compared with continental armies, the number of cases per 1,000 is 11.8, and the number of deaths 6.2. At first sight, one would expect, that, as only men who are found on examination to be healthy are taken as recruits, the number of cases of phthisis ought to be very low. As a matter of fact, however, it is, in Bavaria at least, higher than among civilians of similar age and sex. The reason of this remarkable circumstance is discussed in an article in the *Koenigsberger Zeitung*. How important a factor direct contagion is, the experiments of Cornet show, as well as the fact that hospital attendants fall easy victims to the disease; but Dr. Schmidt believes that the most frequent explanation is that recruits come into the army with a latent tendency to phthisis, and that the conditions under which they are then suddenly placed cause a more or less rapid development of the disease. The knapsack, for instance, appears to have a decidedly prejudicial effect, as is shown by the fact that those regiments which do not wear it present a lower phthisis mortality than those in which it is worn. Again, the diet and the whole regimen of the soldier are, according to Dr. Schmidt, calculated to lessen the power of resistance to the development of phthisis: consequently it is not to be wondered at that a larger proportion of soldiers than of civilians develop it.

A GOOD WORD FOR THE GYPSIES.—There is so great a prejudice against this race, that it is with pleasure that we record testimony in favor of what is claimed to be one of their good points. Every one is familiar with the dusty and dishevelled condition of the modern tramp; but it is claimed by Mr. E. L. Wakeman, in an article in the *Annals of Hygiene* for May, 1889, that the gypsies cannot be accused of uncleanliness. He has made a close study of the race in many lands for more than a quarter of a century, and says that he has never known a physically unclean gypsy, the only exceptions being a few individuals in the towns of southern Hungary and in Havana. The gypsy-camps are always pitched near a brook or stream, and the morning bath is as certain as the morning itself. The cleansing is not of the skin alone; but the garments are constantly washed, and the straw bedding is likewise daily spread out for a sunning and airing.

THE UTILIZATION OF GARBAGE.—According to the *Bulletin of the Rhode Island State Board of Health* for May, the city of Milwaukee will soon abandon the cremation of garbage, which it was among the first of the Western cities to adopt and advocate. It is proposed to substitute a dry process in the place of combustion. A company is at work with a new method which converts cities' refuse into articles more or less salable. The garbage is made to pass through a series of mechanical driers, and in the course of ten hours becomes a brown powder. The oil is pressed out or drawn off, and the residue can be sold as a fertilizer.

CREMATION IN FRANCE.—The Municipal Council of Paris has appropriated 383,299 francs for the erection of a crematory in that city, and has levied a "cremation tax" to defray the expenses of the incineration of the bodies of those whose friends cannot afford to pay for it.

PASTEUR INSTITUTES.—According to the Rome correspondent of the London *Daily News*, the Municipal Council of Rome has decided to devote a sum of money to the formation of a Pasteur institute. Confidence in M. Pasteur's treatment of hydrophobia is increasing in Italy, as is shown by the fact that little by little all the principal towns are providing buildings for the treatment of the disease by inoculation.